

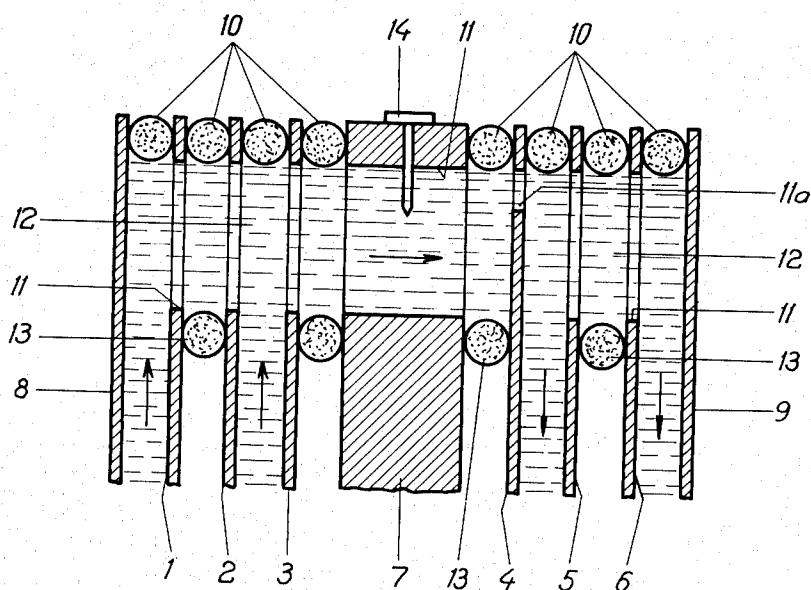
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TEMPERATURE CONTROL FOR HEAT EXCHANGERS

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TEMPERATURE CONTROL FOR HEAT EXCHANGERS

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4 Claims. (Cl. 257—245)

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This invention relates to heat exchangers of the type having a thermometer or thermostat extending into a fluid channel formed by throughflow openings in the plates, for use in controlling the temperatures of the treated liquid. More particularly, the invention relates to an improved exchanger of this type in which the thermometer or thermostat performs its function more effectively than has been possible heretofore under some operating conditions.

In plate heat exchangers as commonly made, the plates are provided with throughflow openings which, when the plates are assembled, form channels for the heat exchange fluids. These openings are usually rather large in order that the channels shall have a sufficient throughflow area for all throughput rates. It has been found, however, that when small throughput rates are used, for example, in the treatment of cream, these large openings are disadvantageous in that a liquid level is formed in the openings which is about midway between their top and bottom edges, or lower. This is an inconvenience when the temperature of the treated liquid is controlled by means of one or more thermometers or thermostats extending into the channels, because the thermo-responsive device may not then extend down into the liquid sufficiently or at all and therefore provides a false indication or control of its temperature.

According to the invention, this inconvenience is avoided by providing in the channel formed by the openings of the plates, and behind the seat of the thermometer or thermostat, a plate provided with a throughflow opening smaller than those in the other plates, which smaller opening is positioned at or near the level of the upper edges of the other openings. In this manner, the level of the liquid is forced to rise until it reaches this smaller opening, so that the channel is completely, or nearly completely, filled with liquid.

The accompanying drawing shows by way of example one embodiment of the invention. In the drawing, the single illustration is a vertical sectional view of a plate heat exchanger constructed in accordance with the invention.

The heat exchange plates 1, 2, 3, 4, 5 and 6 are held vertically in parallel assembled relation at opposite sides of a thicker plate 7 (a so-called coupling plate). The plates are separated from each other and from end sections 8 and 9 by sealing gaskets 10 extending along the peripheral portions of the plates. At their upper portions, the plates are provided with throughflow openings 11 forming a channel 12 through which the liquid

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under treatment flows in the direction of the arrows from alternate plate interspaces situated to the left of the plate 7 to alternate plate interspaces situated to the right of it. The other liquid, that is, the heating or cooling medium, flows through the plate interspaces intermediate these alternate ones. The intermediate interspaces are sealed from channel 12 by gaskets 13 and communicate with a separate throughflow channel (not shown) offset laterally from channel 12, in accordance with the usual practice. It will be understood that the lower portions of the plates are provided with another pair of separate throughflow channels for the respective liquids, to complete the separate paths for the flow of the two liquids through the exchanger. As the arrangement of these other throughflow channels, and the manner of securing the gaskets in position, may be conventional, they require no further description or illustration.

The apparatus as illustrated is provided with only a small number of plates corresponding to a low throughput rate. Accordingly, if each of the plates were formed with the usual opening 11, the channel 12 would be filled with liquid only in its lower half. As a result, control of the liquid temperature by the use of a thermometer or thermostat 14 extending downward into the channel from the top of the exchanger, would be inaccurate, since the thermal device 14 would not extend into the liquid or be sufficiently immersed to provide a true indication of the temperature.

According to the present invention, the plate 4 located beyond the seat 7 for the thermal device 14 (reckoned in the direction of flow through channel 12) is provided with an opening 11a considerably smaller than the openings 11 and positioned with its lower edge at a level well above the lower edges of the latter, that is, at the upper part of channel 12. The upper edge of the overflow opening 11a is situated at the same level as the upper edges of the other openings 11. Thus, the liquid under treatment cannot flow from the left side to the right side of the apparatus, unless it rises as high as the opening 11a, whereby the liquid level will be high enough for adequate immersion of the thermal device 14. In this way, the temperature of the liquid flowing through channel 12 will be accurately measured by the thermal device 14, even though the flow rate is relatively low.

If the throughflow opening 11 in the other plates are circular, it may be advantageous to make the smaller opening 11a circular as well,

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although it can be made oblong, that is, considerably smaller in height than in width.

I claim:

1. A plate heat exchanger comprising a plurality of vertical heat exchange plates provided at their upper portions with throughflow openings forming a channel extending substantially horizontally along the upper portion of the exchanger, and a thermal device extending downward into the upper portion of the channel for use in controlling the temperature of a liquid flowing through the channel, the exchanger being characterized in that said opening in one of the plates, located beyond said device reckoned in the direction of the liquid flow through the channel, is smaller than said openings in the other plates and is located at the upper part of the channel with its lower edge above the level of the lower edges of the other openings and at least as high as approximately the lower end of the thermal device, whereby said device is immersed in the liquid even at relatively low flow rates thereof through said channel.

2. A plate heat exchanger according to claim 1, in which the upper edge of the opening in said one plate is at the same level as the upper edges of the other openings.

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3. A plate heat exchanger according to claim 1, in which said openings are circular.

4. A plate heat exchanger according to claim 1, in which the opening in said one plate is smaller in height than in width.

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